Chapter III – Buildings and Appliances Policies

Option 5: Upgrade Building Energy Codes and Provide Funding for Code Training and Enforcement Activities

Background

Utah is a high-growth state which will see approximately 235,000 new housing units built over the next 10 years. Likewise, a large amount of commercial sector new construction will occur in the state. It is important to maximize the energy efficiency of new homes as well as new commercial buildings given the high growth in the state and the fact that it is much easier to implement energy efficiency measures when a new home or commercial building is constructed than to try to retrofit energy efficiency measures into an existing building.

Building energy codes specify minimum energy efficiency requirements for new buildings or existing buildings undergoing a major renovation. Building energy codes are important because of the "split incentive" that exists for most new buildings. Builders typically bear the capital cost of energy efficiency improvements but do not pay the energy bills after the building is occupied. Consequently, a new home or commercial building is rarely designed to minimize the lifecycle cost.

Utah has had a mandatory statewide energy code for many years. The state adopted the *2006 International Energy Conservation Code* (IECC) for both new residential and new commercial buildings, effective January 1, 2007. Thus, Utah has an up-to-date energy code "on the books." Utah also has a network of home energy raters and inspectors. However, it unclear to what degree the energy code is enforced by local building inspectors. There is some evidence that enforcement and compliance is spotty and that it varies considerably across jurisdictions in the state.[43]

According to the Energy Efficiency Task Force convened by the Western Governors' Association, building energy codes are very cost-effective. The extra first cost for complying with energy codes is usually paid back through energy savings in seven years or less.[44] Furthermore, building energy codes are saving large amounts of energy and money in aggregate in states with well-implemented state-of-the-art energy codes.[45]

Specific Energy Efficiency Proposal

This policy would first ensure that statewide building energy codes continue to be updated every three years. We recommend that the state go beyond the minimum requirements of the IECC when updating its energy codes, including innovative features of

[43] Personal communication with Dave Wilson, Utah Energy Conservation Coalition, Oct. 2006.
[44] See Reference 10, p. 42.
[45] *Clean Energy-Environment Guide to Action*. Washington, DC: U.S. Environmental Protection Agency, April 2006. pp. 4-29 – 4-31.

codes adopted in other states if such features are shown to be cost-effective for building owners in Utah. For example, California has adopted additional energy efficiency requirements for both new homes and new commercial buildings as part of its Title 24 statewide building energy code, including requirements pertaining to lighting in new homes, duct testing and sealing, and roofing reflectivity. These code requirements should be considered for adoption in the future in Utah.

This policy would also provide funding for training of builders, contractors, and local code officials by the State Energy Program, as well as grants to local jurisdictions to co-fund energy-related inspections and better enforce energy codes. We suggest providing on the order of $200,000 per year, with approximately half of this used for training and half provided to local jurisdictions to improve code enforcement. Such efforts have had a high payoff in terms of energy savings per dollar of expenditure elsewhere, and we believe similar results could be achieved in Utah.[46] It should be possible for the state to obtain co-funding for these activities from the U.S. Department of Energy and/or from utilities. In fact, RMP and QGC included a total of $90,000 in their 2007 DSM program budgets for building code-related training provided in partnership with the State Energy Program. Training for builders and local code officials took place during the summer of 2007.

In addition, the State Energy Program and utilities should continue to encourage construction of highly-efficient new homes and commercial buildings that go well beyond the minimum code requirements. Both RMP and QGC are implementing incentive programs for builders of new homes that meet or exceed the ENERGY STAR new homes program criteria. These efforts are starting to pay off, with the number of ENERGY STAR-certified homes in the state increasing by nearly a factor of 10 between 2004 and 2006.[47] Also, the utilities provide incentives for certain energy efficiency measures installed in new commercial buildings. Energy savings from these efforts are counted separately under the utility DSM options.

Energy Savings

We estimate the energy savings and peak demand reduction from upgrading and better enforcing building energy codes by making assumptions about the construction rates in the state during 2006-2020, the fraction of new homes and commercial buildings that would be affected by new energy codes, and the energy savings per home and per unit of floor area in commercial buildings in the homes and commercial buildings impacted by the codes. In particular, we assume construction of 23,500 new housing units and 30 million square feet of new or renovated commercial building floor area per year on average during 2007-2020.[48]

[46] L. Kinney, H. Geller and M. Ruzzin 2003. *Increasing Energy Efficiency in New Buildings in the Southwest*. Boulder, CO: Southwest Energy Efficiency Project, pp. 4-2 – 4-3. http://www.swenergy.org/ieenb/codes_report.pdf.
[47] There were 3,554 ENERGY STAR-certified homes built in Utah in 2006, a 16% market share. Data provided by the ENERGY STAR new homes program, U.S. EPA, Washington, DC, July 2007.
[48] See Reference 46, pp. 3-11 and 3-31. Also, Governor's Office of Planning and Budget, 2005 Baseline Projections.

Regarding energy savings, we assume that the 2006 IECC leads to 5 percent electricity savings and 10 percent natural gas savings in new homes, and 10 percent electricity and natural gas savings in new commercial buildings, relative to standard construction practices in the absence of the new code. We also assume that stepped up training and code enforcement results in 95 percent of new buildings complying with the code requirements. In addition we assume that the energy code is upgraded every three years and that 5 percent additional electricity and natural gas savings are realized each time the code is upgraded.[49]

As part of this analysis, we give credit for energy savings resulting from the adoption of the 2006 version of the IECC because this code was enacted and put into effect after Governor Huntsman adopted the statewide energy efficiency goal. Our assumptions about energy savings from building energy codes are modest in part to avoid double counting savings with utility DSM programs. These programs are promoting beyond-code new construction. Energy savings associated with new homes or commercial buildings that go well beyond code requirement (e.g., ENERGY STAR new homes) are counted under the utility DSM policy options.

Table 4 shows the resulting electricity and natural gas savings in 2010, 2015, and 2020 based on these and other assumptions. The total electricity savings are estimated to reach 674 GWh by 2015 and 1,391 GWh by 2020. Natural gas savings reach about 3.7 million decatherms by 2015 and 7.5 million decatherms by 2020. About 70 percent of the electricity savings comes from commercial buildings while nearly two-thirds of the natural gas savings comes from new residential buildings. To put these savings estimates in perspective, the estimated electricity savings in 2015 is equivalent to about 2 percent of projected statewide electricity consumption without efficiency initiatives, while the estimated natural gas savings in 2015 is equivalent to about 3 percent of projected statewide gas consumption without efficiency initiatives.

Table 4 – Projected Electricity and Natural Gas Savings from Updated and Well-Enforced Building Energy Codes

	Electricity Savings (GWh per year)			**Natural Gas Savings (million decatherms per year)**		
Sector	**2010**	**2015**	**2020**	**2010**	**2015**	**2020**
Residential	54	193	429	0.82	2.47	4.94
Commercial	160	481	962	0.42	1.27	2.54
All	214	674	1,391	1.25	3.74	7.48

[49] These assumptions were derived primarily from the Energy Efficiency Task Force report issued by the Western Governors' Association, see Reference 11. We include savings from the 2006 IECC since it was adopted and put into effect after Gov. Huntsman announced the statewide energy efficiency goal.

Cost and Cost Effectiveness

Regarding the cost to the state of Utah, we are suggesting a budget of $200,000 per year for building code-related training as well as support for building inspections and code enforcement efforts at the local level. It should be possible to obtain a portion of this funding from other sources besides the state budget, such as from the utilities.

Regarding cost to the private sector, upgrading the energy efficiency of new homes and commercial buildings is cost effective. We estimate that upgrading the energy efficiency of a new home in order to comply with the 2006 IECC code will cost about $825 on average but will result in about $120 in annual energy bill savings, meaning a simple payback of around seven years. A seven-year simple payback period was assumed for building energy codes in the WGA Energy Efficiency Task Force report.

In aggregate, we estimate that adopting new energy codes as suggested above will lead to about $440 million in investment in energy efficiency measures during 2006-2015 (discounted net present value). The resulting energy bill savings over the lifetime of these measures would equal about $966 million on a present value basis, meaning a net economic benefit of about $526 million (2006 dollars). Additional net benefits result from more efficient new homes and commercial buildings constructed during 2016-2020.

Environmental and Social Benefits

By reducing the amount of electricity consumed, up-to-date building energy codes would reduce water consumption and the pollutant emissions from operating coal- and gas-fired power plants. We estimate that upgrading and better enforcing building energy codes along the lines proposed here would reduce water consumption in the state approximately 4.2 billion gallons during 2007-2020. Furthermore, we estimate the codes would reduce CO_2 emissions by approximately 651,000 metric tons per year by 2015 and 1.33 million metric tons per year by 2020. These emissions reductions result from both lowering fossil fuel use for electricity generation and from reduced direct natural gas consumption.

Well-designed energy-efficient new buildings provide a number of other benefits besides energy bill savings. These non-energy benefits include greater comfort, residents that are more satisfied with their new homes, workers in commercial buildings that are more productive, fewer health problems due to indoor air pollutants and potential mold buildup, and less litigation over building defects.[50]

Political and Other Considerations

As noted above, Utah has done a good job in adopting up-to-date model energy codes in recent years. The challenge is to train builders, contractors, and local code officials as to what is required and cost-effective ways to comply with codes, and to ensure that all or close to all new homes and commercial buildings meet or exceed the

[50] See Reference 10, pp. 58-59.

codes that are on the books. Code enforcement is the responsibility of local governments (cities and counties). Providing modest funding to local jurisdictions could go a long way to improving energy code enforcement, especially if a city or county is required to demonstrate that they are meeting energy code enforcement standards in return for receiving state funding.

Priority

This policy would yield substantial electricity and natural gas savings as well as economic, environmental, and social benefits. Put simply, it makes sense to "build buildings right" rather than to try to retrofit them with energy efficiency measures later. We recommend that this policy be viewed by the Governor and Legislature as a **high priority.**

Case Study 3:

Energy-Efficient New Homes and Commercial Buildings: Kennecott Daybreak community, South Jordan

Kennecott Land is working with South Jordan to plan a large-scale mixed-use development on 4,126 acres. The plan provides for nearly 14,000 residential units as well as commercial development, making the Daybreak community the largest master-planned community in the history of Utah. Kennecott Land is the only land developer in the nation to be certified with the ISO 14001 Environmental Management System.

ENERGY STAR® Homes

Kennecott is requiring that all homes built in the Daybreak Community be Energy Star® certified. These homes incorporate reduce air leakage, low thermal conductivity windows, improved insulation, and high efficiency heating and cooling systems.

Quick Facts

- **Homeowner Savings:** $200-$400 in annual utility bill savings.
- **Environmental Benefits:** 14,000 Energy Star® housing units will yield around 30,000 tons of avoided carbon dioxide emissions each year, or nearly 1 million tons over 30 years. This is equivalent to taking about 6,700 passenger cars off the road.

Community Center and Elementary School

- LEED Silver certification in 2006
- Features energy-efficient design, natural lighting, and reduced water consumption
- Ground-source heat pump saves Daybreak Elementary School $0.25 per square foot in heating costs compared to what other schools in the Jordan School District pay.

Option 6: Adopt Residential Energy Conservation Ordinances to Upgrade the Energy Efficiency of Existing Homes

Background

Approximately 44,000 existing homes are sold each year in Utah, compared to construction of about 20,000 new homes. A number of jurisdictions in the United States have adopted and successfully implemented residential energy conservation ordinances (RECOs) for the purpose of upgrading the energy efficiency of existing housing. RECOs require homeowners and landlords to implement specific energy efficiency measures, if necessary, at the time a house or rental property is sold or renovated. RECOs are designed to bring the existing housing stock up to a minimum level of energy efficiency. In some cases, the emphasis is on multi-family or rental housing.

RECOs are in place and operating reasonably well in San Francisco, Berkeley, and other communities in California. In California, RECOs pertain to all types of housing. The cities of Burlington, VT and Ann Arbor, MI, and the state of Wisconsin have adopted RECOs that apply only to rental property. In some cases, there is a cost ceiling on how much a property owner has to spend because of the RECO. San Francisco, for example, limits the expenditure to 1 percent of the sales price.[51]

RECOs usually list required energy efficiency measures such as a minimum level of attic insulation, duct sealing and insulation, water heater tank and pipe insulation wrap, and water saving measures. The city or state inspects and certifies that homes or rental units meet the requirements. The City of Berkeley contracts with a community-based non-profit organization to do the inspections.

The Wisconsin statewide program for rental property gives the buyer up to one year to meet the standards. Inspections are done by either a state or private inspector. The state has four people administering the program and recovers the entire cost of the program through modest fees charged to parties responsible for complying with the standards. Nearly 60,000 rental properties were affected during 1985-95.[52]

Specific Energy Efficiency Proposal

This policy would adopt RECOs either at the state or local level. It might be preferable to begin with a RECO for rental property in Salt Lake City, modeled on the Wisconsin program. Rental property owners have little incentive to upgrade the energy efficiency of their property if tenants pay the energy bills. As a result, renters often live in inefficient dwellings. At the same time, many renters have limited incomes and thus a high energy cost burden. The State's Division of Housing and Community Development is already striving for a high level of energy efficiency in the low-income housing it renovates.

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[51] M. Suozzo, K. Wang, and J. Thorne. 1997. *Policy Options for Improving Existing Housing Efficiency*. Washington, DC: American Council for an Energy-Efficient Economy.
[52] Ibid.

We suggest including the following energy efficiency requirements in RECOs in Utah. Efficiency measures already present would not need to be replaced, but property buyers would be given one year to upgrade where measures are lacking. In some cases, property owners would make the upgrades prior to sale in order to advertise that their property passes the RECO.

- Minimum attic insulation level (R-19) in accessible attics
- Double pane low-E windows or reflective low-E window film
- Heating system inspection and tune-up if not done in previous five years
- Sealing and insulating accessible heating and cooling ducts
- Caulking, weatherstripping, and other building envelope air sealing
- Programmable thermostat
- Installing at least 5 compact fluorescent lamps in commonly used light sockets
- Low-flow showerheads and faucet aerators

The State Energy Program could help local governments that adopt RECOs through training and other assistance. Utilities in Utah could support the RECOs by offering rebates and/or low-interest financing for energy efficiency upgrades. Lenders could support RECOs by adding the cost of the energy retrofit into the mortgage for a home or apartment building. Also, the federal tax credit for home retrofit would facilitate the implementation of policies such as RECOs at the state or local level.

The adoption of RECOs is likely to be more effective if there is training and certification of the contractors performing home upgrades. This is due in part to the need to upgrade the skills and work quality of many (although not all) insulation, HVAC, and other home retrofit contractors. Utilities could co-fund contractor training and certification, with the training and certification provided by existing home energy experts in the state.[53] Implementing such training and certification will lead to increased energy and cost savings in homes that are retrofit broadly, not only in those impacted by RECOs.

Experience elsewhere has shown that rigorous tracking and enforcement mechanisms are critical to the success of RECOs.[54] If RECOs are adopted in Utah, the home energy rating (HERS) infrastructure could be used to inspect homes and apartment buildings and certify compliance.

Energy Savings

There is very little information on the energy savings resulting from the implementation of RECOs in other jurisdictions. One report indicates that San Francisco's RECO is reducing average household energy consumption by more than 15 percent.[55] This seems on the high side if it applies to total household energy

[53] For example, the Utah Energy Conservation Coalition and Energy Rated Homes of Utah could provide the training and certification. See www.utahenergy.org.
[54] See Reference 51.
[55] Ibid.

consumption; the 15 percent savings value could refer to heating and cooling energy use only.

Assuming 10 percent overall energy savings on average in Utah to be more conservative, the savings would be about 1,000 kWh and 8 decatherms per year for a typical rental property. Furthermore, we assume that a RECO for rental property is enacted first in the metropolitan Salt Lake City area but then extended to other cities in the state. In total we assume that RECOs affect 150,000 housing units by 2015.[56] These assumptions lead to aggregate energy savings of around 150 GWh and 1.2 million decatherms of natural gas per year by 2015. By 2020, assuming the impacts are extended to an additional 50,000 households, the energy savings could equal 200 GWh and 1.6 million decatherms of natural gas per year.

Cost and Cost Effectiveness

Regarding the cost to the public sector, local governments would need to devote some staff for both adopting and implementing a RECO (assuming implementation is done at the local level). But as noted above, these costs can be paid for by charging a modest fee for certification of homes and apartment buildings, as has been the case in Wisconsin.

Regarding cost to the private sector, we estimate that the cost of the required upgrades would be about $750 in a housing unit that does not need attic insulation but needs all or nearly all of the other measures. Of course the cost will be less if a house or apartment building has some of the efficiency measures already installed. If insulation is needed, the cost will increase by about $800 on average. Assuming one-third of the affected housing units need attic insulation but two-thirds do not, the average upgrade cost is about $1,000 per home.

Based on the energy savings estimates provided above, a household's energy bill (gas and electric) would be reduced by about $155 per year on average given current retail energy prices in Utah. This means a typical payback period of 6.5 years based on the energy savings alone. In addition, there would be some water savings in housing units where low-flow showerheads and faucet aerators are installed. Assuming a 20-year lifetime for the efficiency measures on average, the discounted net economic benefit would be about $930 per household. In aggregate, this implies net economic benefits of $140 million if the policy affects 150,000 housing units during 2007-2015.

Environmental and Social Benefits

RECOs will reduce high energy costs and the burden they place on low-income and working class households. This will increase disposable income as well as make it more likely that these households can pay their utility bills. RECOs will also improve the quality of rental housing, indoor comfort levels, and property value.

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[56] Utah had 201,000 occupied rental housing units out of a total of 752,000 occupied housing units of all types as of 2003, according to the U.S. Census Bureau.

By reducing the amount of electricity consumed, RECOs would reduce water consumption and the pollutant emissions from operating coal- and gas-fired power plants. RECOs also would reduce direct water use by households due to installation of low-flow showerheads and faucet aerators. We estimate that adopting RECOs to the degree assumed above could reduce water consumption in the state by approximately 3.5 billion gallons during 2007-2020.[57] Furthermore, we estimate that RECOs could reduce CO_2 emissions in Utah by approximately 163,000 metric tons per year by 2015 and 219,000 tons per year by 2020.

Political and Other Considerations

It is likely that many apartment building owners and realtors will oppose the adoption of RECOs. Also, cities may view the adoption and implementation of RECOs as overly time consuming and burdensome. In order to increase the chance of success politically, it is important to involve these groups in RECO development from the outset. Also, it may be easier to gain the support of the real estate community if simple and easy-to-implement energy requirements are adopted. It may be necessary to compromise on stringency in order to gain broader support and ultimately approval.

Adopting a RECO is just one step towards achieving energy savings in existing housing. Once the ordinance is adopted, it is very important to educate building owners, contractors, auditors, and local building inspectors on the requirements and on how they can be met. In addition, it is important to enforce the ordinance and do so in a rigorous yet flexible manner; e.g., allowing extra time for compliance before any fines are levied and ensuring that homeowners with limited disposable income, such as the elderly, are given adequate technical and financial assistance.

Priority

This policy would yield relatively limited electricity and natural gas savings, but the economic, environmental and social benefits could be significant. We recommend that it be viewed by the Governor, Legislature and major cities in Utah as a **medium priority.**

[57] Most of this water savings is from the installation of low-flow showerheads and faucet aerators.

Option 7: Adopt Lamp and Appliance Efficiency Standards for Products Not Covered by Federal Standards

Background

The federal government has adopted minimum energy efficiency standards on a wide range of products including refrigerators, clothes washers, air conditioners, furnaces, water heaters, fluorescent lamps and ballasts, HVAC equipment used in commercial buildings, and motors. These standards have saved a large amount of energy while being very cost-effective for consumers.[58] States are preempted from adopting efficiency standards on products already regulated by the federal government, but states can adopt efficiency standards on products not covered by the national standards.

In recent years, a number of states, including Arizona, California, Oregon, and Washington, have adopted efficiency standards on products not covered by federal standards. The standards prohibit the sale of non-complying products after a phase-in period. Products covered by state efficiency standards include transformers, commercial packaged air conditioning equipment, commercial refrigerators and freezers, commercial clothes washers, exit signs, torchiere light fixtures, and traffic signals. Some of these standards were subsequently included in the Energy Policy Act of 2005 and thus became national in scope. But there are still some products that one or more states have adopted efficiency standards for, but which are not yet covered at the federal level.

The Appliance Standards Awareness Project (ASAP – www.standardsasap.org) prepares model state standards legislation and assists states by analyzing the impacts of the model standards. It is logical to consider adopting these standards in Utah, especially for those products that other states have already adopted standards.

There is growing interest in phasing out inefficient incandescent light bulbs and replacing them across the board with compact fluorescent lamps (CFLs) or other types of efficient lamps. In early 2007, the government of Australia announced that it will ban ordinary incandescent lamps by 2009 or 2010.[59] Two legislative proposals along these lines have been introduced in California—one would prohibit sale of ordinary incandescent lamps by 2012, the other would set minimum efficiency standards in two phases (in 2013 and 2018) that would effectively ban ordinary incandescent lamps.[60] California had already adopted standards that require sale of more efficiency incandescent lamps in that state, while Nevada adopted stringent efficiency standards for

[58] S. Nadel. "Appliance and Equipment Efficiency Standards." *Annual Review of Energy and Environment*. Vol. 27, pp. 159-192. 2002.
[59] "Australia Screws in Compact Fluorescent Lights Nationwide." Environmental News Service, Feb. 21, 2007. http://www.ens-newswire.com/ens/feb2007/2007-02-21-01.asp
[60] Assembly Bill No. 722, Introduced by Assembly Member Levine, California Legislature – 2007-08 Regular Session. Feb. 22, 2007. Assembly Bill No. 1109, Introduced by Assembly Member Huffman, California Legislature – 2007-08 Regular Session. Feb. 23, 2007. Also, see "California may ban conventional lightbulbs by 2012." Reuters New Service, Jan. 30, 2007.

general service lamps in June, 2007. The standards, which take effect in 2012, cannot be met by ordinary incandescent lamps.

Specific Energy Efficiency Proposal

This policy would adopt energy efficiency standards for general service lamps, starting with a standard of 25 lumens per watt by 2012 and reaching 45 lumens per watt by 2016. Ordinary incandescent light bulbs sold today only provide about 15 lumens per watt while CFLs provide 60 lumens per watt or more. These standards would apply to general purpose lamps but not to appliance, colored, infrared, three-way, and other types of specialty lamps. These standards are consistent with recommendations made by a lighting efficiency coalition in March, 2007.[61]

This policy would also adopt minimum energy efficiency standards on four products not covered by national energy efficiency standards. Products sold in Utah would have to meet these minimum efficiency requirements once the standards take effect, say on January 1, 2009. The exact standards would be derived from the latest ASAP model bill that a number of states are likely to consider in 2007.

The products we recommend considering for state standards include metal halide light fixtures, single-voltage AC to DC power supplies, incandescent reflector lamps not covered by federal standards, and walk-in refrigerators and freezers. Standards on these products offer moderate energy savings potential and are very cost effective for consumers in Utah. Manufacturers already produce numerous products that meet the standards. And if the standards do not take effect until 2009, vendors would be given adequate time to clear out their current inventory of non-complying products.

Energy Savings

Table 5 includes estimates of the electricity savings in 2015 and 2020 from each part of this proposal. Regarding the lamp standards, we assume that the use of CFLs continues to grow in the interim period due to utility DSM programs and market forces, with households adopting three to four CFLs on average before the standards take effect. However, this policy still has a large impact on residential electricity use.[62] We estimate that it would eventually save 1,140 kWh per year per household, equivalent to about 58 percent of the total electricity use for lighting in households on average.[63] In addition to

[61] Alliance Calls for Only Energy-Efficient Lighting in U.S. Market by 2016, Joins Coalition Dedicated to Achieving Goal. Press Release. Washington, DC: Alliance To Save Energy. March 14, 2007. http://www.ase.org/content/news/detail/3644.

[62] We do not count the savings here from the CFLs assumed to be adopted through utility DSM programs and market forces.

[63] The average household in the U.S. uses an estimated 1,946 kWh of electricity per year for lighting. See. *U.S. Lighting Market Characterization*. Report prepared by Navigant Consulting, Inc. for the U.S. Department of Energy, Sept. 2002. http://www.eere.energy.gov/buildings/info/documents/pdfs/lmc_vol1_final.pdf.

the electricity savings in homes, Table 5 includes savings from the replacement of ordinary incandescent bulbs in commercial buildings.

Table 5 – Projected Electricity Savings and Economic Benefits from Lamp and Appliance Efficiency Standards

Policy component	Electricity Savings (GWh/yr)		Net Economic Benefit (million 2006 $)
	2015	2020	
Appliance standards	107	183	103
Lighting standards	1,227	1,954	648
Combination	1,334	2,137	751

Overall, we estimate that this policy would cut electricity use in 2015 by 1,334 GWh per year with the savings growing to 2,137 GWh per year by 2020. About 90 percent of the savings results from the lamp standards.

Cost and Cost Effectiveness

Appliance efficiency standards have proven to be very cost-effective for consumers with the energy bill savings far exceeding any increased first cost. ASAP estimates a payback period of two years or less for any increase in first cost for each of the products in the proposed appliance standards package. Furthermore, ASAP estimates that this set of standards would provide about $103 million in net economic benefits for Utah's consumers and businesses.[64]

Regarding the efficiency standards on general service lamps, we assume it eventually leads to the purchase of 35 additional CFLs per household at a cost of $3.00 per CFL, on average. However, these lamps would save $88.90 in their first year of operation (2006 dollars). The net economic benefit statewide from the lamp standards would be about $648 million (discounted net present value). This estimate covers a 10-year period after general service lamps are replaced, and it includes savings to both households and businesses.

There should be very little cost to the state for adopting and implementing appliance and lighting efficiency standards, as long as the standards have already been adopted by other states.

[64] Analysis prepared by the Appliance Standards Awareness Project, Boston, MA, http://www.standardsasap.org/a062_ut.pdf.

<u>Environmental and Social Benefits</u>

By reducing the amount of electricity consumed, the efficiency standards would reduce water consumption by power plants. The estimated total water savings are 605 million gallons per year by 2015 and 1.0 billion gallons per year by 2020. During 2008-2020, the standards would reduce water consumption in the state by an estimated 5.9 billion gallons.

Table 6 shows the estimated pollutant emissions reductions in 2015 and 2020 from reduced operation of coal- and gas-fired power plants. By cutting air pollutant emissions, the efficiency standards would have a beneficial effect on public health and would help the state meet its air quality goals, in addition to reducing the state's contribution to global warming.

Table 6 – Estimated Emissions Reduction from the Proposed Lamp and Appliance Standards

Pollutant	Avoided Emissions in 2015	Avoided Emissions in 2020
Carbon dioxide (thousand metric tons)	895	1,433
SO_2 (short tons)	60	96
NOx (short tons)	374	598
Mercury (pounds)	5.3	8.5

<u>Political and Other Considerations</u>

There has been little or no opposition to the proposed appliance standards in other states. If the appliance standards are adopted, it will be necessary to monitor compliance and enforce the standards. This does not need to be onerous. The model appliance standards bill requires manufacturers to certify that qualifying products meet the standards. Utah could rely on the certification process adopted in California (i.e., Utah could state that certification in California is sufficient for a product to be sold in Utah).

The lighting efficiency standards are more controversial, as it appears that some manufacturers oppose them while others support them. However, momentum could grow to enact the standards in many states or possibly nationwide. As noted above, the policy would apply to general purpose incandescent lamps but not to specialty lamps, thereby making it less onerous. By moving ahead with this policy, Utah would be in the vanguard of an important energy efficiency initiative.

The Utah State Energy Program or some other state agency could allocate a small amount of money and staff time to: a) informing relevant vendors such as hardware stores, lighting distributors, and electric supply houses about the efficiency and lighting standards, and b) conducting spot checks in these establishments to ensure that only complying products are sold. If a non-complying product is found, both the vendor and manufacturer should be told to stop selling the product. No product testing is required to implement or enforce the standards.

Priority

This policy, if it includes the lighting standards, would yield relatively substantial electricity savings, economic benefits, and emissions reductions. We recommend that it be viewed by the Governor and Legislature as a **high priority.**

Option 8: Expand Low-Income Home Weatherization

Background

The U.S. Census Bureau, Utah Census 2004, indicates that 10.9 percent of individuals and 8.2 percent of families in Utah live below the federal poverty level.[65] Low-income households spend a much greater portion of their income on energy than medium and high-income households. While a median household spends about 3 percent of its income on energy, the typical low-income household spends nearly 12 percent of its limited income on energy, with very low-income households spending 20 to 25 percent.[66]

Energy prices have increased in recent years, but the incomes of low-income households have not increased in a corresponding manner, meaning that utility bills now pose an even greater challenge for low-income households. This leads to choices between heating and eating, to health and safety issues, family instability, and homelessness.

Home weatherization and energy efficiency assistance can help mitigate the effects of high utility rates for low-income families. Presently there are two low-income housing assistance programs in Utah that help reduce home energy costs: 1) the Olene Walker Housing Loan Fund, and 2) the Weatherization Assistance Program.

The Olene Walker Housing Loan Fund (OWHLF) is a revolving loan fund that provides money to build multifamily housing for low-income families. The Fund requires that housing must be ENERGY STAR-certified and offers incentives to assist with costs associated with the certification. The fund is supported by a leveraging ratio of $11 from federal and other sources for each dollar contributed by the state.[67] As of January 2007, the OWHLF has issued over 500 grants to multi-family units meeting ENERGY STAR standards.[68]

The Weatherization Assistance Program (WAP) provides energy-efficiency improvements to low-income households. The WAP is administered by the Utah Division of Housing and Community Development, which implements retrofit projects through eight government and non-profit agencies.[69,70] The bulk of the funding comes from the

[65] Direct Testimony of Christine R. Keyser on Behalf of the Utah Committee Of Consumer Services, In the Matter of HELP, Electric Lifeline Program Evaluation, Docket No. 04-035-21. September 15, 2006.
[66] Consultation with Elizabeth Wolf, Community Action Program, 4 December 2006; and Colton, Roger, *On the Brink: 2005, The Home Energy Affordability Gap.* April 2006.
[67] Utah Olene Walker Housing Loan Fund, http://community.utah.gov/housing_and_community_development/OWHLF/.
[68] Consultation with Lisa Yoder, Division of Housing and Community Development. January 11, 2007.
[69] L. Nelson. *2006 Energy Advisor Report to the Utah Legislature: Energy Policy and Development in Utah.* October 18, 2006.
[70] Weatherization Assistance Program, http://community.utah.gov/housing_and_community_development/weatherization_assistance_program/index.html (accessed July 20, 2007).

federal government (between $4-5 million per year[71]), with some supplemental funding from Questar Gas Company ($250,000 in 2006 and $500,000 in 2007[72]) and Rocky Mountain Power ($104,317 in 2004, $56,101 in 2005, and $95,567 in 2006[73]).

The WAP currently retrofits approximately 1,500 homes per year. On average, these retrofits save 1,180 kWh of electricity and 37.3 decatherms of natural gas per year per household.[74] However, there are approximately 1,000 households on the waiting list, and households generally have to wait two to three years before they are served by the program. A recent study by GDS Associates, Inc. estimates that approximately 70 percent of low-income households in Utah need additional weatherization measures.[75] It is estimated that there are 78,000 low-income households in Utah, but this number has not been updated to reflect Utah's growing population and shifts in the housing market.[76]

Distribution of low-cost energy efficiency kits along with energy education is another low-income energy efficiency program that Utah has not implemented but which has been successful in other states. On average, the kits cost between $50-100 (which includes the kit materials, education materials, and the training and implementation measures), and yield an average savings of around $117/year (977 kWh/year and 6.7 decatherms/year).[77] With the passage of House Bill 1200 in 2006, Colorado will spend $19 million over four years on low-cost home energy efficiency kits/improvements. The Colorado Governor's Office of Energy is in the process of distributing approximately 27,000 low-cost energy efficiency kits to Colorado's low-income households and is conducting an impact evaluation of three distribution methods.[78]

Specific Energy Efficiency Proposal

This policy would increase the number of energy efficiency and weatherization retrofits of low-income households in Utah through the following mechanisms:

1) Provide state funding to expand the budget of the WAP to $10 million per year. Doing so would enable the program to weatherize 3,000 low-income homes annually, for a total of 42,000 low-income homes by 2020.[79] The $10 million budget could be

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[71] Weatherization Assistance Program, http://community.utah.gov/housing_and_community_development/weatherization_assistance_program/index.html.
[72] Personal communication with Dan Dent, Questar Gas Company, Salt Lake City, UT, March 12, 2007.
[73] Personal communication with Jeff Bumgarner, PacifiCorp, Portland, OR, March 12, 2007.
[74] Personal communication with Michael Johnson, State Weatherization Assistance Program, Salt Lake City, UT, March 12 and July 6, 2007.
[75] *The Maximum Achievable Cost Effective Potential Gas DSM for Questar Gas, Final Report Prepared for the Utah Natural Gas DSM Advisory Group,* March 2004, GDS Associates, Marietta, GA.
[76] See Reference 70.
[77] S.M. Khawaja and J.E. Steiner. *Energy Efficiency through Education and Low-Cost Measures*. Quantec, LLC. Home Energy Magazine. September/October 2005.
[78] Personal communication with Jeff Ackermann, Governor's Office of Energy, Denver, CO, March 15, 2007.
[79] This figure assumes that the WAP will retrofit 1,500 homes per year in 2006-2007 and begin retrofitting 3,000 homes per year starting 2008 through 2020.

achieved by supplementing federal funds with state funds as well as additional utility DSM monies.

2) Allocate $3.0 million over eight years ($375,000 per year) for the distribution of 40,000 low-cost energy efficiency kits (5,000 kits per year for eight years), reaching approximately half of Utah's low-income households. This funding could come from equal contributions from the state and the utilities. The cost (approximately $75 per kit) would include the kit components, education materials, distribution, implementation, and possibly installation. Utah could learn from and build on the experience of the Colorado effort in this area to determine the most cost-effective means of achieving high installation rates and energy savings through distribution of low-cost efficiency measures to low-income households.

Energy Savings

Table 7 includes estimates of the electricity and natural gas savings in 2015 and 2020 from each component of this option. Taken together, the two components would save around 71 GWh and 1.28 million decatherms of natural gas per year by 2015. By 2020, the projected energy savings reach 89 GWh and 1.84 million decatherms per year. These savings refer to the entire WAP effort during 2006-2020, not just the expansion called for in this option. In addition, we assume that energy savings persist through 2020.[80]

Table 7 – Projected Energy Savings and Economic Benefits from Expanding the State Weatherization Assistance Program and Distributing Low-Cost Energy Efficiency Kits

Policy component	Electricity Savings (GWh/yr)		Natural Gas Savings (million decatherms/yr)		Net Economic Benefit (million 2006 $)
	2015	2020	2015	2020	
Weatherization Program	32	50	1.01	1.57	68.8
Low-cost Kits	39	39	0.27	0.27	8.4
Combination	71	89	1.28	1.84	77.2

Cost and Cost Effectiveness

The cost per household of the WAP is approximately $3,000, while participating households realize approximately $456 savings per year[81], after the completion of weatherization improvements. The cumulative cost to implement the WAP at a higher level would be about $90 million during 2006-2015 and $140 million during 2006-2020.

[80] In situations where an energy savings measure wears out, such as in the case of a CFL burning out at the end of its lifetime, we assume that the occupant replaces the measure with another energy-efficient product.
[81] The $456 savings figure is based on WAP estimates of electricity and natural gas energy savings per household per year and current energy prices. See Reference 74.

The net economic benefit statewide from expanding the WAP starting in 2008 would be about $69 million (discounted net present value). This estimate assumes a 20-year average lifetime for energy savings measures.

The cost per household for disseminating low-cost energy efficiency kits and energy education is approximately $75 on average. However, if the measures and actions taken in response to energy education save approximately $117 per year, the payback is less than one year on average. Over the life of the kits and other actions, the savings-to-investment ratio of the kits is anywhere from two to five, depending on the education mechanisms employed and assumed lifetime of the low-cost measures. Conservatively assuming a 3-year life for the measures and actions in response to kit distribution and energy education, the net economic benefit from distributing the 40,000 kits is $8.4 million (discounted net present value).

Combined, the two components of this proposal have a net economic benefit of about $77 million. Regarding the total cost to state government, we estimate a cost of around $4 million per year primarily for the expansion of the weatherization program. This leads to a total cost to the state of about $36 million on a discounted net present value basis.

Environmental and Social Benefits

Improving the energy efficiency of low-income households will provide broad social benefits including increasing property values, making homes more comfortable and safe, reducing utility bill arrearages, and making more income available for food, medical care, child care, etc. In addition, there will be some reduction in pollutant emissions due to less consumption of electricity and natural gas. We estimate that this option would reduce CO_2 emissions in Utah by approximately 48,000 metric tons per year by 2015 and 60,000 tons per year by 2020.

Political and Other Considerations

Efforts to increase state and utility funding for low-income weatherization may be viewed as a tax or rate increase on consumers in general. Consequently, there could be political opposition to this option. On the other hand, this option serves a segment of the population that badly needs energy efficiency assistance. Also, low-income households rarely participate in other types of energy efficiency programs. Therefore, a strong case can be made for government funding (both federal and state) for this program.

Priority

Even though this option yields low energy savings and could face political opposition, it benefits a key segment of society that faces a high energy cost burden and tends not to be influenced by other types of energy efficiency programs. Therefore, we recommend that it by viewed by the Governor, Legislature, and Public Service Commission as a **high priority.**

Case Study 4:

Weatherization Assistance: Typical Home Retrofit, Northern Utah

In late 2006, a 1920's Northern Utah home was retrofitted by the Utah Weatherization Assistance Program (WAP). This home had virtually zero insulation in the attic, walls, floors and kneewalls. Due to the lack of insulation, the homeowner faced extremely high gas bills, despite participating in the utility's equal payment plan.

The WAP spent a week-and-a-half retrofitting this home with proper insulation. The efficiency measures increased the attic insulation to R38, walls and kneewalls to R13, and also improved insulation of the floors. In addition, heating ducts were sealed, the furnace was tune-up, and 18 windows were replaced with low-e, high efficiency windows.

According to the homeowner, the home retrofit cut monthly natural gas costs from about $140 to $45 per month on average.

Quick Facts:

Project cost: $4,400
Annual natural gas saving: $1,140
Payback period: 3.9 years

Source: Michael Johnson, Weatherization Assistance Program Director, and Loran Kowallis, Bear River Association of Governments
Photo credit: Bear River Association of Governments

Option 9: Adopt State Tax Credits for Highly-Efficient New Homes, Commercial Buildings, and Heating and Cooling Equipment

Background

Federal tax credits are now available for highly-efficient new homes and commercial buildings that exceed the ENERGY STAR performance levels. For new homes, builders are eligible for a credit of $2,000 for new homes that use 50 percent or less of the heating and cooling energy of homes just meeting the 2003 IECC building energy code. For commercial buildings, a tax deduction of up to $1.80 per square foot is available to owners or tenants of commercial buildings (both new and existing) that use 50 percent or less energy for heating, cooling, ventilation, and lighting as compared to buildings that just meet the ASHRAE 90.1 2001 standard (now part of the IECC energy code). Partial deductions of up to $0.60 per square foot are offered for improvements to lighting, the HVAC (heating, ventilation, air-conditioning and cooling) system, or the building envelope. Federal tax credits are also offered to consumers who purchase high-efficiency space heating, water heating, and cooling equipment.[82]

State tax incentives can complement the federal incentives and thereby help to establish a market for highly-efficient new homes, commercial buildings, and HVAC equipment. For example, Nevada has adopted legislation that provides a reduction in property taxes for new commercial buildings that meet or exceed the LEED (Leadership in Energy and Environmental Design) silver standards.[83] Legislation introduced in Nevada in 2007 would provide a property tax reduction to new homes that meet the LEED silver performance criteria. In addition, legislation recently adopted in New Mexico provides a state income tax credit for highly-efficient homes and commercial buildings.[84]

Specific Energy Efficiency Proposal

This policy would provide a state tax credit for new homes, heating and cooling equipment, and commercial buildings that qualify for the federal tax credit or deduction. The tax credits could be provided to building owners to complement the federal incentive provided to builders in the case of new homes. We suggest adopting state tax credits for at least ten years in order to provide builders and other market actors with some certainty that the investments they make will qualify for the incentives. At the end of this period, the tax incentives could be reviewed and either maintained, modified, or discontinued based on the impact they are having, the cost to the state, and the projected value for continuing them.

Tax credits along the lines proposed here would complement the utility incentives offered in Utah for ENERGY STAR new homes and for efficiency improvements in commercial buildings. The utility incentives encourage “good practice” while the recommended tax credits would be available for “best practice,” such as new homes or

[82] For details, see the Tax Incentive Assistance Project web site, http://www.energytaxincentives.org/.
[83] For details regarding these tax incentives, see http://energy.state.nv.us/LEED/R220-05A.pdf.
[84] For details on the New Mexico legislation, see http://www.swenergy.org/legislative/2007/newmexico/index.html.

commercial buildings that use 50 percent or less energy for heating and cooling (and lighting in the case of commercial buildings), as compared to homes and buildings just meeting current energy codes.

We also suggest state tax incentives for modern energy- and water-efficient evaporative cooling systems, along the lines of the tax incentives proposed in New Mexico. Such equipment performs much better than traditional "swamp coolers" while substantially cutting electricity use and peak power demand for cooling as compared to mechanical cooling (air conditioning) systems.[85] However, there are hurdles to establishing modern evaporative cooling systems in the marketplace, including the significantly higher first cost compared to traditional evaporative coolers. Rocky Mountain Power's recent incentives have resulted in very little adoption of whole-house premium evaporative coolers in Utah.[86]

Energy Savings

It is difficult to estimate the impact that tax incentives for highly-efficient new homes, commercial buildings, and HVAC equipment could have. The purpose of the incentives is to help establish markets for state-of-the-art efficiency measures and practices, and the potential market response is uncertain. For the sake of this analysis, we assume that 5 percent of new homes and commercial buildings constructed during 2007-2020 will qualify for the tax incentives, and that these homes save 20 percent of the electricity and natural gas used for heating, cooling and water heating, in addition to the energy savings resulting from improved building energy codes and/or utility DSM programs. This is a conservative assumption but should avoid double counting of energy savings among policies and programs.

With respect to HVAC equipment, we do not assume any additional energy savings from state tax credits in order to avoid double counting savings that accrue through utility incentive programs. However, we assume that 5,000 homes install modern evaporative cooling systems over a 10-year period in response to tax credits, and that each of these homes cuts their cooling electricity use by 2,500 kWh per year as a result.[87]

Table 8 shows the resulting electricity and natural gas savings in 2010, 2015 and 2020 based on these assumptions. The energy savings are very modest, reaching 24.5 GWh and 0.14 million decatherms of natural gas per year by 2015. However, the tax incentives could still be useful for stimulating the construction of some highly-efficient new homes and commercial buildings in the state, and for establishing a market for modern, high-performance evaporative cooling equipment. This could result in further market transformation over the long run, e.g., by laying the groundwork for future utility incentive programs and/or energy code upgrades.

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[85] *New Evaporative Cooling Systems: An Emerging Solution for Homes in Hot Dry Climates with Modest Cooling Loads.* Boulder, CO: Southwest Energy Efficiency Project. April 2004. http://www.swenergy.org/pubs/Evaporative_Cooling_Systems.pdf.
[86] *2004 Evaporative Cooling and Central Air Conditioning Incentive Program: Evaluation.* Report prepared by Quantec LLC for PacifiCorp, May 10, 2005.
[87] See Reference 85, p. 8.

Table 8 – Projected Electricity and Natural Gas Savings from Tax Credits for Highly-Efficient New Homes, Commercial Buildings, and HVAC Equipment

Sector	Electricity Savings (GWh per year)			Natural Gas Savings (million decatherms per year)		
	2010	2015	2020	2010	2015	2020
Residential	4.6	14.0	21.7	0.03	0.10	0.15
Commercial	3.5	10.5	16.3	0.01	0.04	0.06
All	8.1	24.5	38.0	0.04	0.14	0.21

Cost and Cost Effectiveness

In order to estimate the potential cost to the state of Utah, we assume state tax credits of $1,000 per qualifying home, $0.50 per square foot of qualifying commercial floor space, and $750 per qualifying evaporative cooler. With the participation levels assumed above, this leads to a total cost to the state in terms of forgone tax revenue of $21.5 million over 14 years (2007-2020), or about $1.5 million per year on average. In all likelihood the cost to the state would be below average in the early years and above average in later years as the market for qualifying homes, commercial buildings, and state-of-the-art evaporative cooling systems becomes established. On a discounted net present value basis, the cost to the state would be around $15 million.

Regarding costs and cost effectiveness to the private sector, we estimate net economic benefits assuming average lifetimes of 30 years for new homes, 20 years for commercial buildings, and 15 years for evaporative coolers. With the assumed participation levels, the resulting net economic benefits are $12.3 million for the owners of highly-efficient new homes, $16.3 million for occupants of the commercial buildings, and $10.4 million for homes adopting qualifying evaporative cooling systems. The total estimated net economic benefit is $39 million.

Environmental and Social Benefits

Since this policy results in relatively limited direct energy savings, it also would have relatively limited direct environmental benefits. We estimate that the tax credits would reduce CO_2 emissions in Utah by approximately 24,000 metric tons per year by 2015 and 36,000 tons per year by 2020.

Promoting modern evaporative cooling systems would result in increased water use by households. But part of this increased water use would be offset by reduced water consumption for power generation.[88] Overall, the policy as a whole would result in no net increase in water use, as the water savings associated with reduced power generation would offset the increased water use in homes that install modern evaporative cooling systems.

[88] See Reference 85, pp. 7-9.

Political and Other Considerations

Tax credits are generally a popular policy because they provide financial support for targeted measures. Home builders and commercial property owners and managers are likely to support the proposed tax credits. The downside is the cost to the state government and the fact that many worthy initiatives compete for scarce state resources. Severance tax revenue from natural gas and other minerals production might be one source of funding for tax credits along the lines suggested here.

Priority

This policy would yield relatively modest energy savings and economic benefits. Also, the cost to the state is non-trivial. On the other hand, state tax credits focused on cutting edge energy efficiency measures could complement other state policies and programs as well as federal policy, and help to establish markets for state-of-the-art energy efficiency technologies in Utah. Taking all of this into account, we recommend that this option be viewed by the Governor and Legislature as a **medium priority.**